



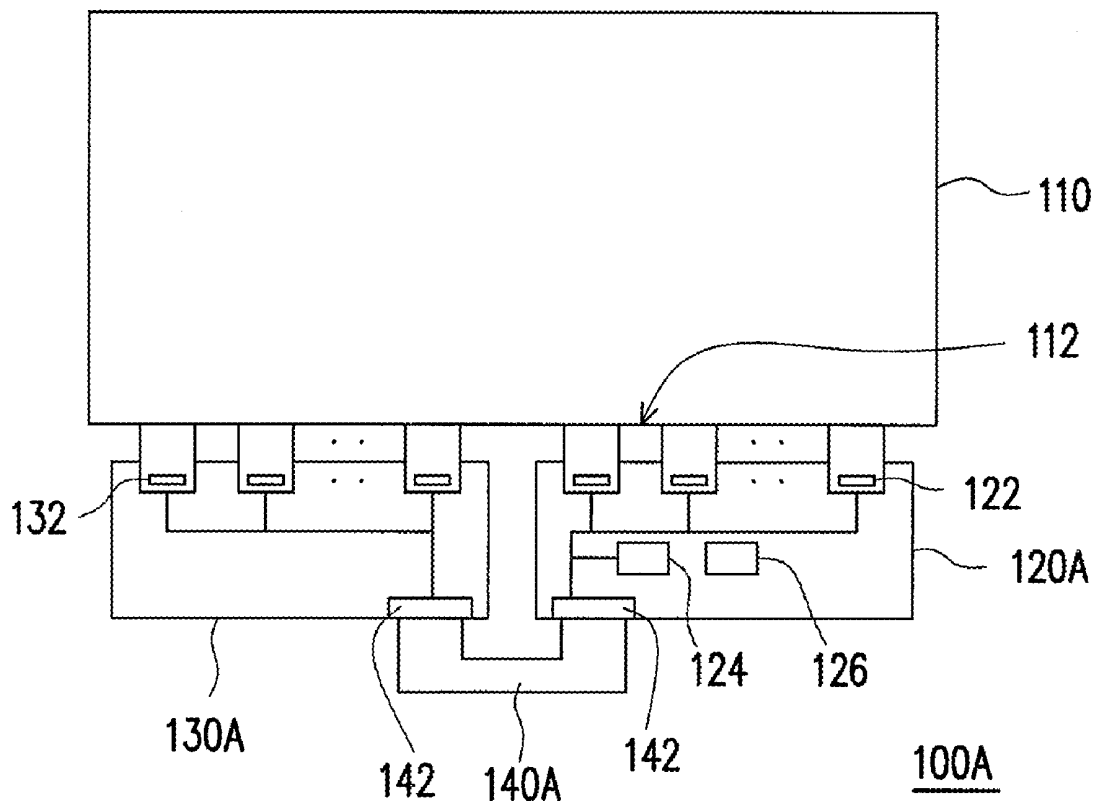
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(19) **United States**(12) **Patent Application Publication**
Lin et al.(10) **Pub. No.: US 2011/0273655 A1**(43) **Pub. Date: Nov. 10, 2011**(54) **LIQUID CRYSTAL DISPLAY****Publication Classification**(75) Inventors: **Wen-Tsung Lin**, Miao-Li County (TW); **Yung-Yu Tsai**, Miao-Li County (TW); **Ching-Wen Shih**, Miao-Li County (TW); **Feng-Shuo Kuo**, Miao-Li County (TW); **Sen-Yi Wang**, Miao-Li County (TW); **Ming-Shiang Lee**, Miao-Li County (TW)(51) **Int. Cl.**
G02F 1/1345 (2006.01)(52) **U.S. Cl.** **349/149**(73) Assignee: **CHIMEI INNOLUX CORPORATION**, Miao-Li County (TW)(57) **ABSTRACT**

A liquid crystal display (LCD) including a backlight module and a liquid crystal panel module is provided. The liquid crystal panel module is disposed at one side of the backlight module. The liquid crystal panel module includes a liquid crystal panel, a first driving circuit board, a second driving circuit board, and a connector. The first driving circuit board has a plurality of first driving chips and a timing controller. The second driving circuit board has a plurality of second driving chips. The first driving circuit board and the second driving circuit board are electrically connected to a same side of the liquid crystal panel. The connector electrically connects the first driving circuit board and the second driving circuit board.

(21) Appl. No.: **13/097,492**(22) Filed: **Apr. 29, 2011**(30) **Foreign Application Priority Data**

May 10, 2010 (TW) 99114813



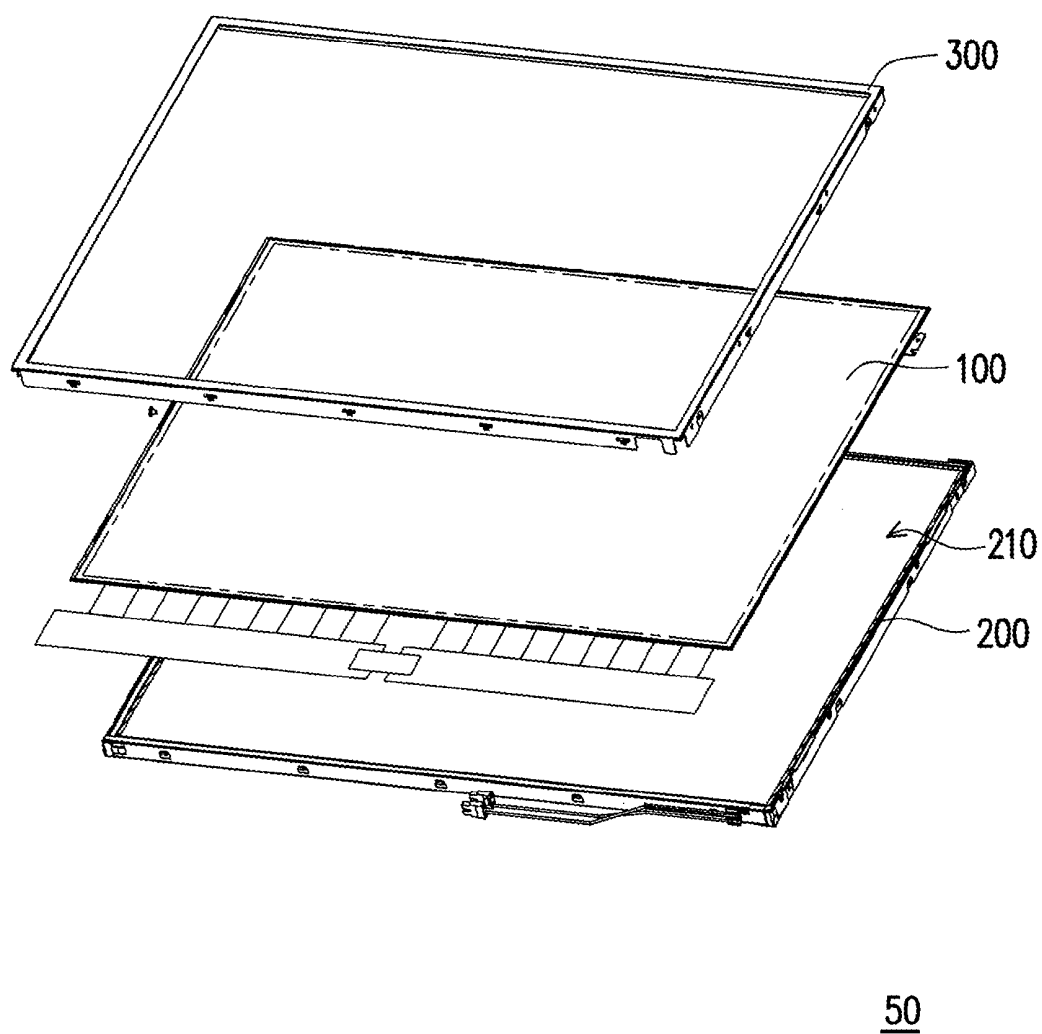


FIG. 1

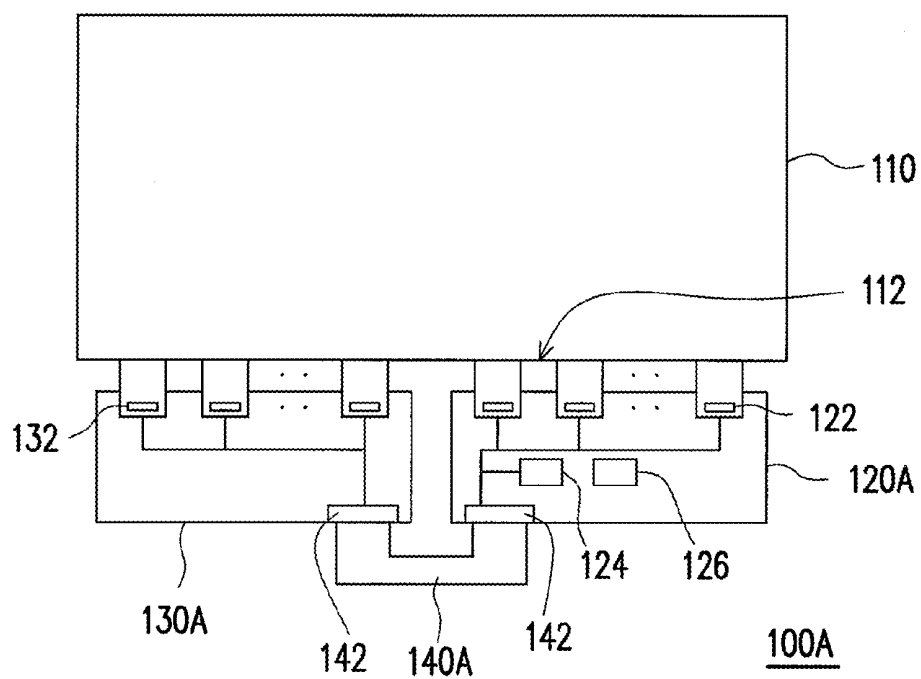


FIG. 2

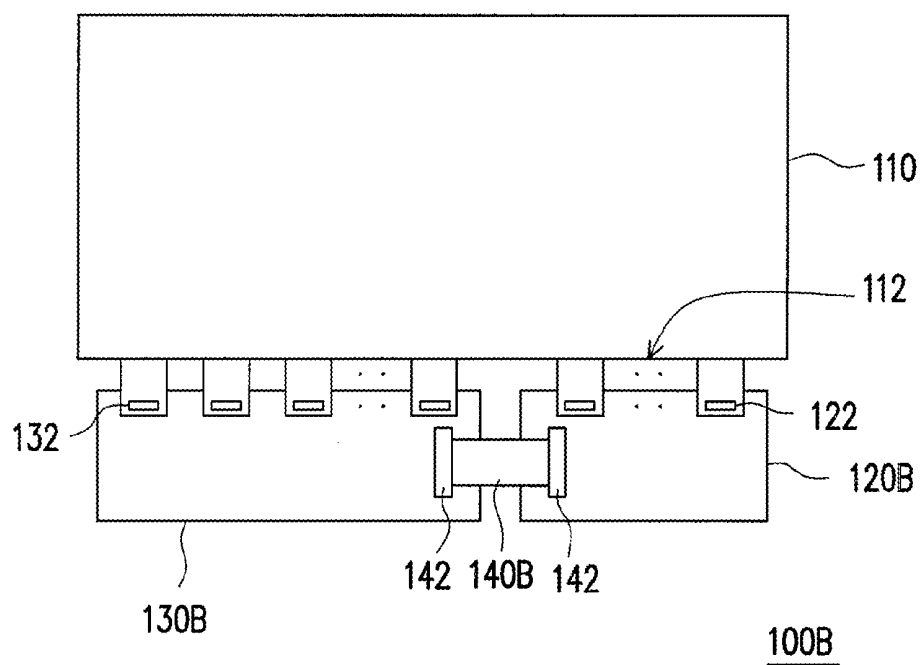


FIG. 3

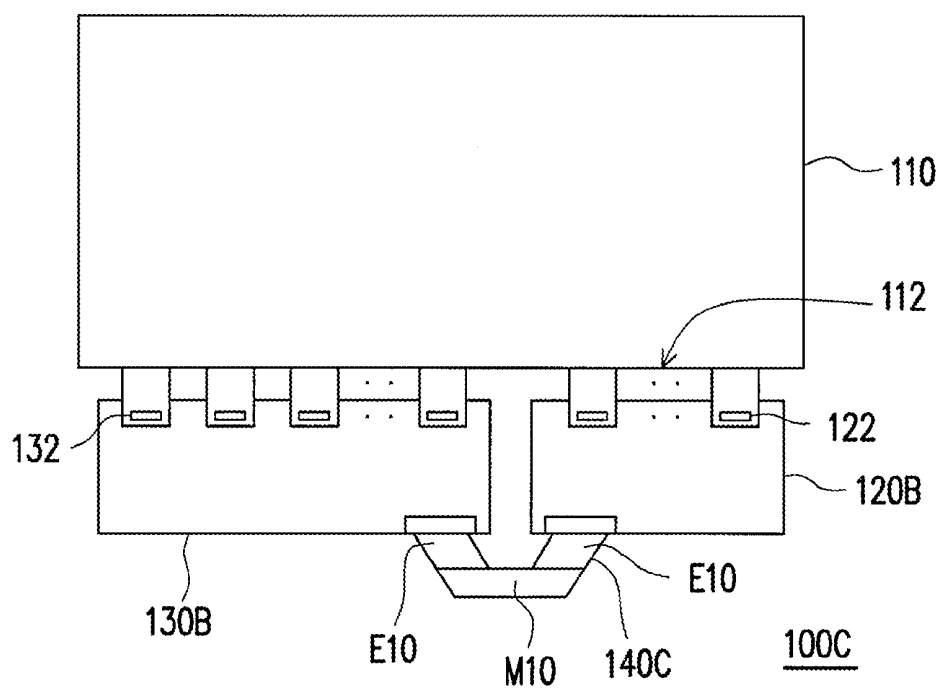


FIG. 4

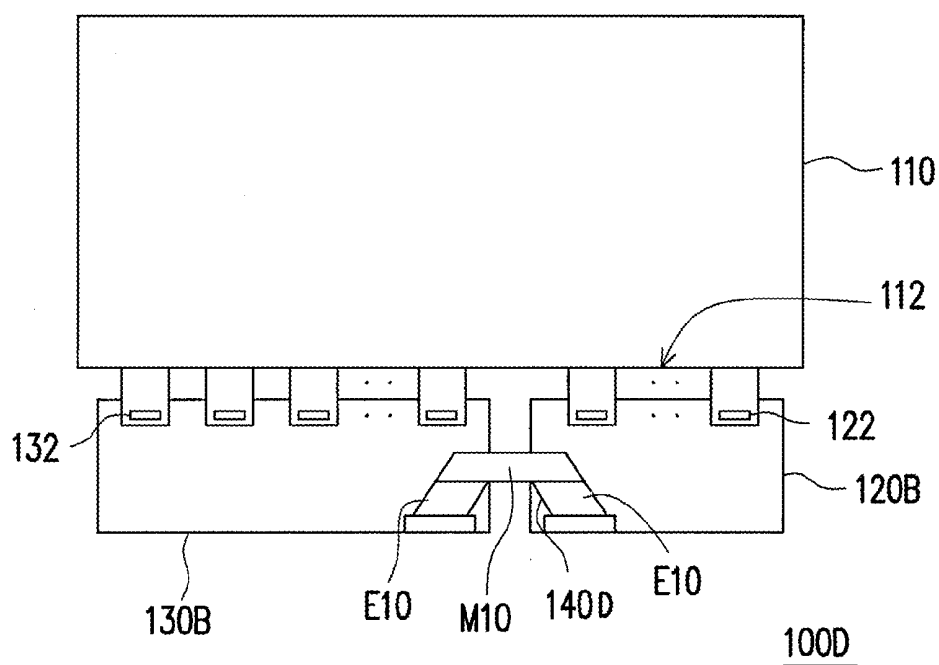


FIG. 5

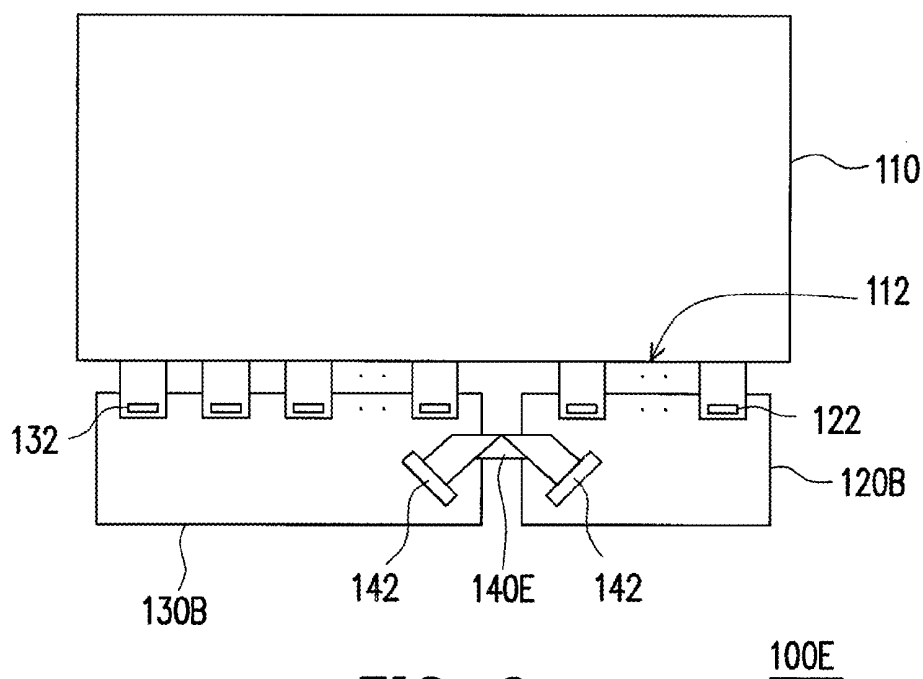


FIG. 6

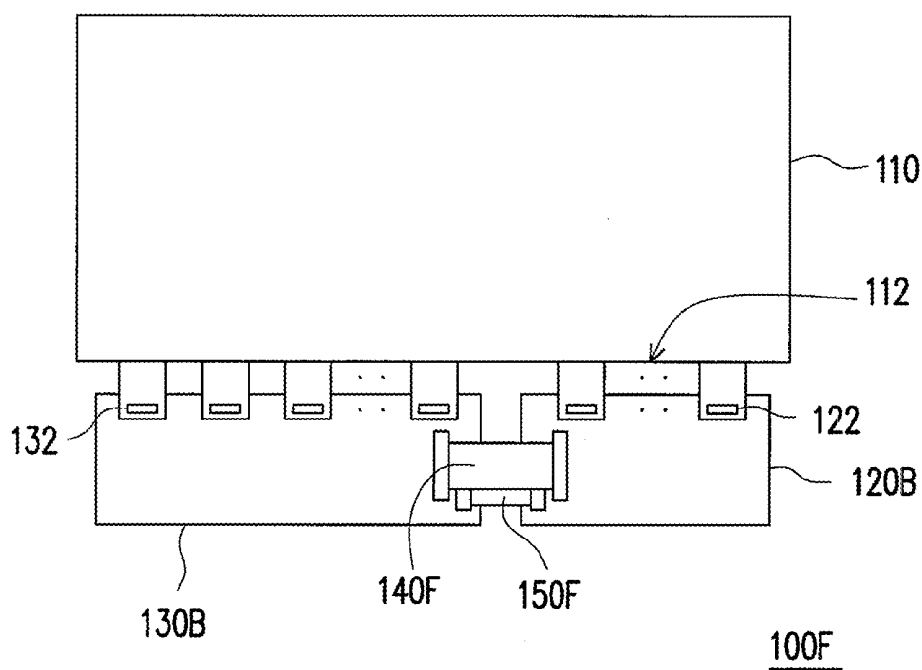


FIG. 7

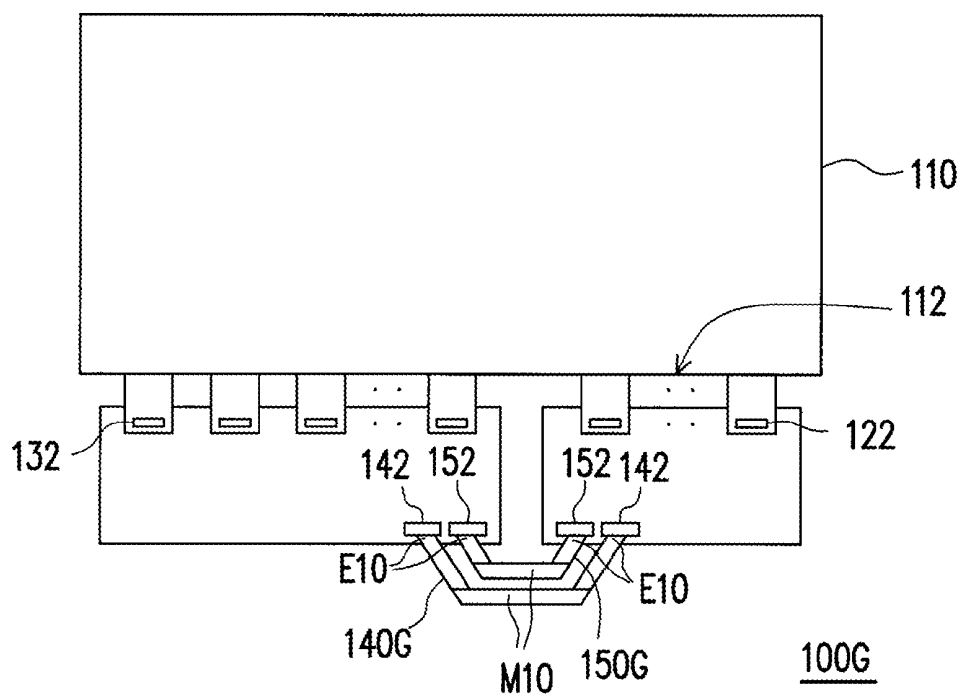


FIG. 8

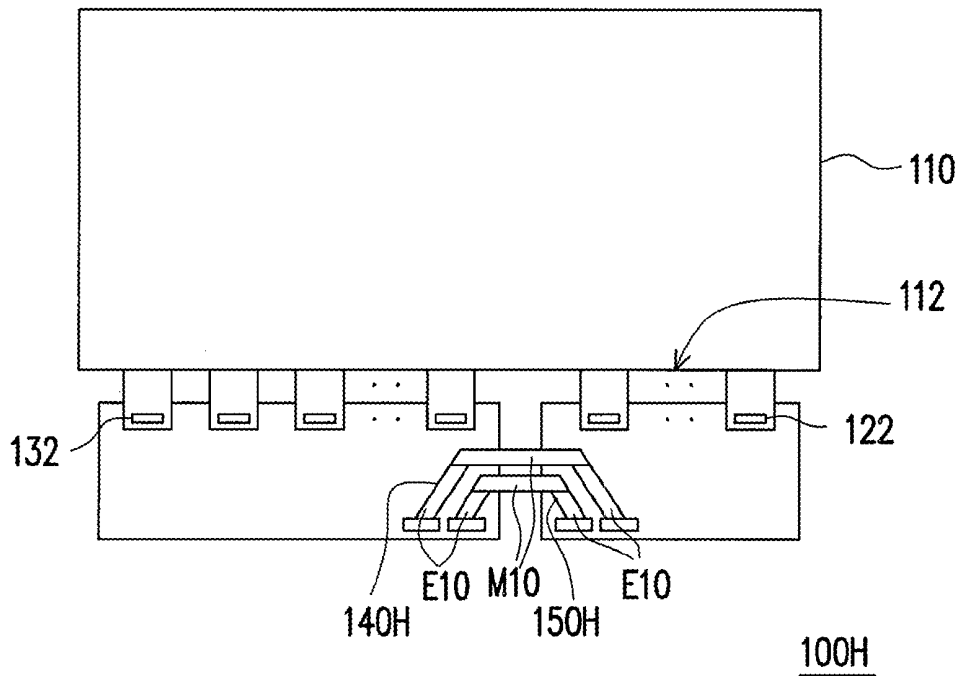


FIG. 9

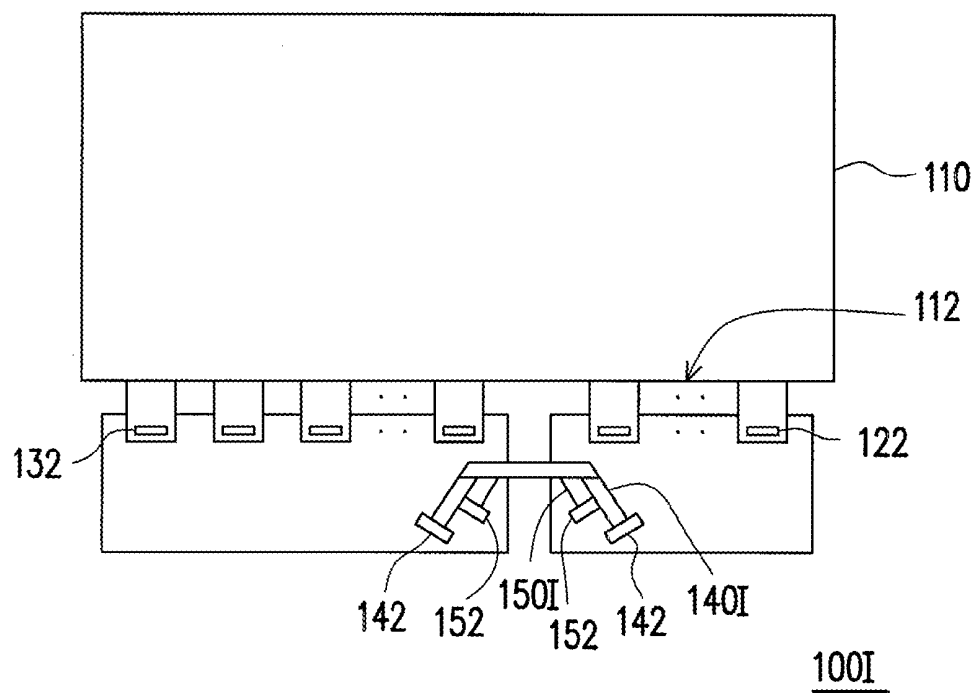


FIG. 10

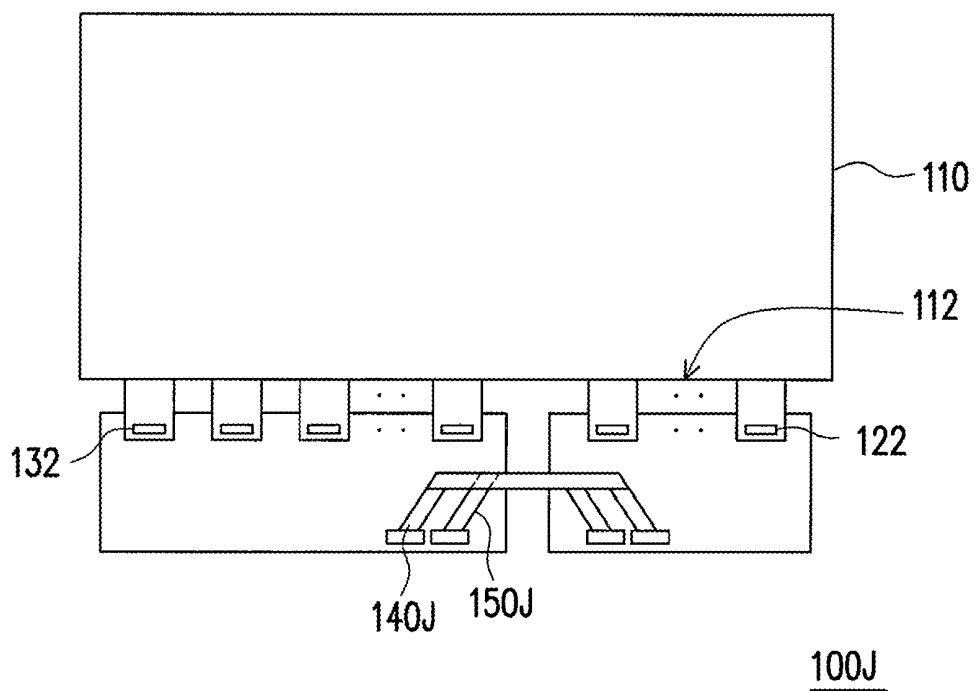


FIG. 11

LIQUID CRYSTAL DISPLAY

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority benefit of Taiwan application serial no. 99114813, filed on May 10, 2010. The entirety of the above-mentioned patent application is hereby incorporated by reference herein and made a part of this specification.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention generally relates to a display, and more particularly, to a liquid crystal display (LCD).

[0004] 2. Description of Related Art

[0005] In recent years, flat panel displays have been quickly developed along with the maturation of photoelectric technology and semiconductor manufacturing technology. Particularly, LCD has gradually replaced the conventional cathode ray tube (CRT) display as the mainstream product in the display market thanks to its many advantages such as low operation voltage, no radiation, light weight, and small volume.

[0006] A conventional technique for driving the liquid crystal panel of a LCD is to transmit a control signal from a control circuit board to a connected driving circuit board through a connector and then drive the connected liquid crystal panel through a driving chip on the driving circuit board. However, since such a structure requires multiple circuit boards and multiple connectors, the material cost and labor cost thereof are very high. Moreover, along with the increase in the size of LCD, a single driving circuit board may be easily deformed or even damaged. Even though this problem can be resolved by disposing two driving circuit boards, the material cost and labor cost of circuit boards and connectors will be further increased.

SUMMARY OF THE INVENTION

[0007] Accordingly, the invention is directed to a liquid crystal display (LCD) with reduced fabrication cost.

[0008] The invention provides a LCD including a backlight module and a liquid crystal panel module. The liquid crystal panel module is disposed at one side of the backlight module. The liquid crystal panel module includes a liquid crystal panel, a first driving circuit board, a second driving circuit board, and a first connector. The first driving circuit board has a plurality of first driving chips and a timing controller. The second driving circuit board has a plurality of second driving chips. The first driving circuit board and the second driving circuit board are electrically connected to a same side of the liquid crystal panel. The first connector electrically connects the first driving circuit board and the second driving circuit board.

[0009] According to an embodiment of the invention, the number of the first driving chips and the number of the second driving chips may be the same or different.

[0010] According to an embodiment of the invention, the first connector is in a straight bar shape, and the first connector may be bent twice. Two ends of the first connector are closer to or farther away from the liquid crystal panel than a central part of the first connector. Two joints of two ends of the first connector are in a straight bar shape, and a length direction of

the joints is parallel to, forms an acute angle with, or is perpendicular to the side of the liquid crystal panel.

[0011] According to an embodiment of the invention, the first connector is in a U shape.

[0012] According to an embodiment of the invention, the liquid crystal panel module further includes a second connector. The first connector and the second connector partially overlap each other. The length of the first connector may be greater than the length of the second connector. The first connector and the second connector may be respectively in a straight bar shape. The first connector and the second connector may be respectively bent twice. Two ends of the first connector are closer to or farther away from the liquid crystal panel than a central part of the first connector, and two ends of the second connector are closer to or farther away from the liquid crystal panel than a central part of the second connector. Four joints of four ends of the first connector and the second connector are in a straight bar shape, and a length direction of the joints is parallel to, forms an acute angle with, or is perpendicular to the side of the liquid crystal panel.

[0013] According to an embodiment of the invention, the liquid crystal panel module further includes a second connector. The first connector and the second connector are placed side by side without overlapping each other. The first connector and the second connector may be respectively bent twice.

[0014] According to an embodiment of the invention, the liquid crystal panel module further includes a second connector. The first connector and the second connector are respectively bent twice, and the length of the first connector and the length of the second connector are the same.

[0015] As described above, in a LCD provided by the invention, a timing controller is integrated with a driving circuit board so that both the labour cost and the material cost spent on the circuit board and the connectors can be reduced.

[0016] These and other exemplary embodiments, features, aspects, and advantages of the invention will be described and become more apparent from the detailed description of exemplary embodiments when read in conjunction with accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0018] FIG. 1 is an explosion diagram of a liquid crystal display (LCD) according to an embodiment of the invention.

[0019] FIGS. 2-11 are respectively a diagram of a liquid crystal panel module according to a first to a tenth embodiment of the invention.

DESCRIPTION OF THE EMBODIMENTS

[0020] Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings.

[0021] Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0022] FIG. 1 is an explosion diagram of a liquid crystal display (LCD) according to an embodiment of the invention. Referring to FIG. 1, the LCD 50 in the present embodiment

includes a liquid crystal panel module **100** and a backlight module **200**. The liquid crystal panel module **100** is disposed at one side of the backlight module **200**. To be specific, the liquid crystal panel module **100** is disposed on a light emitting surface **210** of the backlight module **200**. In the present embodiment, the backlight module **200** adopts a side-light design. However, when the size of the LCD **50** is 37" or even larger, the backlight module **200** usually adopts a direct-light design. Besides, the LCD **50** may further have a front frame **300** for steadily disposing the liquid crystal panel module **100** on the backlight module **200**. Below, different implementations of the liquid crystal panel module **100** applicable to the LCD **50** will be described.

[0023] FIG. 2 is a diagram of a liquid crystal panel module according to a first embodiment of the invention. Referring to FIG. 2, the liquid crystal panel module **100A** in the present embodiment includes a liquid crystal panel **110**, a first driving circuit board **120A**, a second driving circuit board **130A**, and a first connector **140A**. The first driving circuit board **120A** has a plurality of first driving chips **122** and a timing controller **124**. The second driving circuit board **130A** has a plurality of second driving chips **132**. Both the first driving circuit board **120A** and the second driving circuit board **130A** are electrically connected to the side **112** of the liquid crystal panel **110**. The first connector **140A** electrically connects the first driving circuit board **120A** and the second driving circuit board **130A**.

[0024] Because in the present embodiment, there are two driving circuit boards **120A** and **130A**, the driving circuit boards won't be deformed or even damaged even if the size of the liquid crystal panel module **100A** is very large. In addition, because the timing controller **124** is integrated with the first driving circuit board **120A**, the numbers of circuit boards and connectors are reduced and accordingly the material and labor cost spent on circuit boards and connectors are also reduced.

[0025] In the present embodiment, all the first driving chips **122** and the second driving chips **132** are configured to drive data lines of the liquid crystal panel **110**. However, the first driving chips **122** and the second driving chips **132** may also be configured to drive scan lines or other components of the liquid crystal panel **110**. A DC-DC converter chip **126** may be further disposed on the first driving circuit board **120A** or the second driving circuit board **130A** to provide appropriate working voltages to the timing controller **124**, the first driving chips **122**, and the second driving chips **132**. The first connector **140A** in the present embodiment is in a U shape (i.e., the circuit on the first connector **140A** also presents a U shape). Two joints **142** at two ends of the first connector **140A** are in a straight bar shape, and the length direction of the joints **142** is parallel to the side **112** of the liquid crystal panel **110** so that the widths of the first driving circuit board **120A** and the second driving circuit board **130A** can be reduced. In the present embodiment, the number of the first driving chips **122** is the same as the number of the second driving chips **132**, and the length of the first driving circuit board **120A** is approximately the same as the length of the second driving circuit board **130A**.

[0026] While designing the circuit layouts on the first driving circuit board **120A**, the second driving circuit board **130A**, and the first connector **140A**, the line impedances from the timing controller **124** to each first driving chip **122** and

each second driving chip **132** are made close to each other, so as to prevent signal interference and deterioration caused by different line impedances.

[0027] FIG. 3 is a diagram of a liquid crystal panel module according to a second embodiment of the invention. Referring to FIG. 3, the liquid crystal panel module **100B** in the present embodiment is similar to the liquid crystal panel module **100A** illustrated in FIG. 2, and only the differences between the two will be described herein. In the present embodiment, the first connector **140B** of the liquid crystal panel module **100B** is in a straight bar shape, so that the circuits on the first connector **140B** can have the same length and impedance. In addition, the length direction of the two joints **142** at the two ends of the first connector **140B** is perpendicular to the side **112** of the liquid crystal panel **110**. Moreover, the number of the first driving chips **122** is different from the number of the second driving chips **132**, and the length of the first driving circuit board **120B** is different from the length of the second driving circuit board **130B**.

[0028] FIGS. 4-6 are respectively a diagram of a liquid crystal panel module according to a third to a fifth embodiment of the invention. Referring to FIG. 4, the liquid crystal panel module **100C** in the present embodiment is similar to the liquid crystal panel module **100B** illustrated in FIG. 3, and only the differences between the two will be described herein. In the present embodiment, the first connector **140C** of the liquid crystal panel module **100C** is bent twice. The first connector **140C** also presents a straight bar shape before it is bent so that the circuits on the first connector **140C** can have the same length and impedance. In addition, the central part **M10** of the first connector **140C** is farther away from the liquid crystal panel **110** than the two ends **E10** of the first connector **140C**, so that the first connector **140C** is prevented from contacting the liquid crystal panel **110**. Referring to FIG. 5, the liquid crystal panel module **100D** in the present embodiment is similar to the liquid crystal panel module **100C** illustrated in FIG. 4, and only the differences between the two will be described herein. In the present embodiment, the central part **M10** of the first connector **140D** of the liquid crystal panel module **100D** is closer to the liquid crystal panel **110** than the two ends **E10** of the first connector **140D** so that the first connector **140D** is prevented from exceeding the range of the first driving circuit board **120B** and the second driving circuit board **130B** or being collided during the assembly process. Referring to FIG. 6, the liquid crystal panel module **100E** in the present embodiment is similar to the liquid crystal panel module **100D** illustrated in FIG. 5, and only the differences between the two will be described herein. In the present embodiment, the two joints **142** at the two ends of the first connector **140E** of the liquid crystal panel module **100E** are in a straight bar shape, and the length direction of the joints **142** forms an acute angle (for example, 45°) with the side **112** of the liquid crystal panel **110** so that the widths of the first driving circuit board **120B** and the second driving circuit board **130B** can be appropriately reduced.

[0029] FIG. 7 is a diagram of a liquid crystal panel module according to a sixth embodiment of the invention. Referring to FIG. 7, the liquid crystal panel module **100F** in the present embodiment is similar to the liquid crystal panel module **100B** illustrated in FIG. 3, and only the differences between the two will be described herein. In the present embodiment, the liquid crystal panel module **100F** further includes a second connector **150F**. The first connector **140F** and the second connector **150F** overlap each other. In addition, the length of

the first connector **140F** is greater than the length of the second connector **150F** so that the joint between the first connector **140F** and the first driving circuit board **120B** and the joint between the second connector **150F** and the second driving circuit board **130B** can be staggered. The first connector **140F** and the second connector **150F** respectively present a straight bar shape. Since two connectors **140F** and **150F** are adopted, the widths of the first driving circuit board **120B** and the second driving circuit board **130B** can be reduced.

[0030] FIGS. **8-11** are respectively a diagram of a liquid crystal panel module according to a seventh to a tenth embodiment of the invention. Referring to FIG. **8**, the liquid crystal panel module **100G** in the present embodiment is similar to the liquid crystal panel module **100F** illustrated in FIG. **7**, and only the differences between the two will be described herein. In the present embodiment, the first connector **140G** and the second connector **150G** of the liquid crystal panel module **100G** are respectively bent twice. The first connector **140G** and the second connector **150G** are also in a straight bar shape before they are bent, so that the circuits on the first connector **140G** and the second connector **150G** can have the same length and impedance. In addition, two central parts **M10** of the first connector **140G** and the second connector **150G** are farther away from the liquid crystal panel **110** than the four ends **E10** of the first connector **140G** and the second connector **150G**, so that the first connector **140G** and the second connector **150G** are prevented from contacting the liquid crystal panel **110**. The four joints **142** and **152** at four ends of the first connector **140G** and the second connector **150G** are in a straight bar shape, and the length direction of the joints **142** and **152** is parallel to the side **112** of the liquid crystal panel **110**. The first connector **140G** and the second connector **150G** are disposed side by side without overlapping each other.

[0031] Referring to FIG. **9**, the liquid crystal panel module **100H** in the present embodiment is similar to the liquid crystal panel module **100G** illustrated in FIG. **8**, and only the differences between the two will be described herein. In the present embodiment, the two central parts **M10** of the first connector **140H** and the second connector **150H** of the liquid crystal panel module **100H** are closer to the liquid crystal panel **110** than the four ends **E10** of the first connector **140H** and the second connector **150H**, so that the first connector **140H** is prevented from exceeding the range of the first driving circuit board **120B** and the second driving circuit board **130B** or being collided during the assembly process.

[0032] Referring to FIG. **10**, the liquid crystal panel module **100I** in the present embodiment is similar to the liquid crystal panel module **100H** illustrated in FIG. **9**, and only the differences between the two will be described herein. In the present embodiment, the two joints **142** and **152** at two ends of the first connector **140I** and the second connector **150I** of the liquid crystal panel module **100I** are in a straight bar shape, and the length direction of the joints **142** and **152** forms an acute angle with the side **112** of the liquid crystal panel **110**. In addition, in the present embodiment, the first connector **140I** and the second connector **150I** overlap each other partially.

[0033] Referring to FIG. **11**, the liquid crystal panel module **100J** in the present embodiment is similar to the liquid crystal panel module **100I** illustrated in FIG. **10**, and only the differences between the two will be described herein. In the present embodiment, the first connector **140J** and the second connector

for **150J** of the liquid crystal panel module **100J** have the same length, and the two are disposed side by side and partially overlap each other.

[0034] In summary, in a LCD provided by the invention, two driving circuit boards are adopted so that the driving circuit boards won't be deformed or even damaged due to the affection of gravity. In addition, the timing controller is integrated with one of the driving circuit boards so that the numbers of circuit boards and connectors are reduced and accordingly the material and labor cost is reduced.

[0035] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A liquid crystal display (LCD), comprising:

a backlight module;

a liquid crystal panel module, disposed at one side of the backlight module, the liquid crystal panel module comprising:

a liquid crystal panel;

a first driving circuit board, having a plurality of first driving chips and a timing controller;

a second driving circuit board, having a plurality of second driving chips, wherein the first driving circuit board and the second driving circuit board are electrically connected to a same side of the liquid crystal panel; and

a first connector, electrically connecting the first driving circuit board and the second driving circuit board.

2. The LCD according to claim 1, wherein a number of the first driving chips is the same as a number of the second driving chips.

3. The LCD according to claim 1, wherein a number of the first driving chips is different from a number of the second driving chips.

4. The LCD according to claim 1, wherein the first connector is in a straight bar shape.

5. The LCD according to claim 4, wherein the first connector is bent twice.

6. The LCD according to claim 5, wherein two ends of the first connector are closer to the liquid crystal panel than a central part of the first connector.

7. The LCD according to claim 5, wherein two ends of the first connector are farther away from the liquid crystal panel than a central part of the first connector.

8. The LCD according to claim 5, wherein two joints of two ends of the first connector are in a straight bar shape, and a length direction of the joints is parallel to the side of the liquid crystal panel.

9. The LCD according to claim 5, wherein two joints of two ends of the first connector are in a straight bar shape, and a length direction of the joints forms an acute angle with the side of the liquid crystal panel.

10. The LCD according to claim 5, wherein two joints of two ends of the first connector are in a straight bar shape, and a length direction of the joints is perpendicular to the side of the liquid crystal panel.

11. The LCD according to claim 1, wherein the first connector is in a U shape.

12. The LCD according to claim **1**, wherein the liquid crystal panel module further comprises a second connector, and the first connector and the second connector partially overlap each other

13. The LCD according to claim **12**, wherein a length of the first connector is greater than a length of the second connector.

14. The LCD according to claim **12**, wherein the first connector and the second connector are respectively in a straight bar shape.

15. The LCD according to claim **14**, wherein the first connector and the second connector are respectively bent twice.

16. The LCD according to claim **15**, wherein two ends of the first connector are closer to the liquid crystal panel than a central part of the first connector, and two ends of the second connector are closer to the liquid crystal panel than a central part of the second connector.

17. The LCD according to claim **15**, wherein two ends of the first connector are farther away from the liquid crystal panel than a central part of the first connector, and two ends of the second connector are farther away from the liquid crystal panel than a central part of the second connector.

18. The LCD according to claim **15**, wherein four joints of four ends of the first connector and the second connector are

in a straight bar shape, and a length direction of the joints is parallel to the side of the liquid crystal panel.

19. The LCD according to claim **15**, wherein four joints of four ends of the first connector and the second connector are in a straight bar shape, and a length direction of the joints forms an acute angle with the side of the liquid crystal panel.

20. The LCD according to claim **15**, wherein four joints of four ends of the first connector and the second connector are in a straight bar shape, and a length direction of the joints is perpendicular to the side of the liquid crystal panel.

21. The LCD according to claim **1**, wherein the liquid crystal panel module further comprises a second connector, and the first connector and the second connector are placed side by side without overlapping each other.

22. The LCD according to claim **21**, wherein the first connector and the second connector are respectively bent twice.

23. The LCD according to claim **1**, wherein the liquid crystal panel module further comprises a second connector, the first connector and the second connector are respectively bent twice, and a length of the first connector and a length of the second connector are the same.

* * * * *

专利名称(译)	液晶显示器		
公开(公告)号	US20110273655A1	公开(公告)日	2011-11-10
申请号	US13/097492	申请日	2011-04-29
[标]申请(专利权)人(译)	群创光电股份有限公司		
申请(专利权)人(译)	奇美群创光电		
当前申请(专利权)人(译)	群创光电		
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发明人	LIN, WEN-TSUNG TSAI, YUNG-YU SHIH, CHING-WEN KUO, FENG-SHUO WANG, SEN-YI LEE, MING-SHIANG		
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外部链接	Espacenet USPTO		

摘要(译)

提供一种包括背光模块和液晶面板模块的液晶显示器 (LCD)。液晶面板模块设置在背光模块的一侧。液晶面板模块包括液晶面板，第一驱动电路板，第二驱动电路板和连接器。第一驱动电路板具有多个第一驱动芯片和时序控制器。第二驱动电路板具有多个第二驱动芯片。第一驱动电路板和第二驱动电路板电连接到液晶面板的同一侧。连接器电连接第一驱动电路板和第二驱动电路板。

